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ELECTRONICS AND ELECTRICAL ENGINEERING

(FOUO 1/82)

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USSR REPORT

ENGINEERING AND EQUIPMENT

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FUEL UTILIZATION'

Leningrad TRUDY TSENTRAL'NOGO NAUCHNO-ISSLEDOVATEL'SKOGO INSTITUTA MORSKOGO FLOTA:
SUDOVAYA ENERGETIKA I TOPLIVOISPOL'ZOVANIYE in Russian No 260, 1980 (signed to press
20 Oct 80) pp 109-111

UDC 629.12-8

PUTTING TOGETHER POWER PLANT SYSTEMS FOR SPECIALIZED SHIPS

[Abstract of article by Maslov, V.V., and Feofanov, A.V.]

[Text] The authors discuss the structure of power plant systems with low- and
medium-revolution internal combustion engines that have been built in recent years,
along with the outfitting of these systems with auxiliary equipment. Technical and
operating requirements for the structure of these systems and their production as
complete units have been developed. Figures 10; references 6.

UDC 621.431.74:621.436/-192

TECHNIQUE FOR PREDICTING THE RELIABILITY OF MARINE DIESEL ENGINES

[Abstract of article by Karpov, L.N.]

[Text] The author proposes a technique for predicting the reliability indicators of
marine diesel engines that is based on the use of the reliability indicators of the
basic assemblies of the engine in question in comparison with a base indicator, be-
cause of the various improvements in assemblies that have been modernized that make
it possible to make a quantitative evaluation of the degree of improvement in their
reliability. Figures 2.

UDC 629.12-8:53.08

ON ACOUSTIC-EMISSION DIAGNOSTIC SYSTEMS

[Abstract of article by Ignatov, V.N.]

[Text] The author discusses the problems connected with, the basic construction
principles, and the use of acoustic-emission equipment used in technical diagnos-
tics. He presents the results of experimental data on the use, under both marine

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and laboratory conditions, of the acoustic-emission equipment that has been developed. Figures 3; references 6.

UDC 621.438

THE POSSIBILITY OF USING THE AI-20 GAS TURBINE ENGINE AS THE AIR SOURCE IN A PNEUMATIC WASHING SYSTEM

[Abstract of article by Roslik, Ya.F., Selyugin, N.G., and Pogrebnik, N.V.]

[Text] The authors present the results of bench tests of an AI-20 aviation gas turbine engine with increased counterpressure beyond the turbine and air takeoff beyond the compressor. They also describe the stand and the noise suppressors at the compressor's air intake and the gas's point of discharge from the turbine. Figures 5; references 4.

UDC 621.438

INVESTIGATION OF THE FUNCTIONING OF PNEUMATIC WASHING DEVICES UNDER FULL-SCALE OPERATING CONDITIONS

[Abstract of article by Gitel'man, A.I., Selyugin, N.G., and Levykin, B.P.]

[Text] The authors give the results of an investigation of the performance of a pneumatic washing device under various operating conditions. They also present a technique for determining the air source's basic parameters according to the drop in pressure at the compressor's intake. Figures 8; references 2.

UDC 629.12-757.42

RATIONALITY OF THE UTILIZATION OF HEATING OF A SHIP'S HULL TO COMBAT ICING

[Abstract of article by Roslik, Ya.F., and Selyugin, N.G.]

[Text] The authors discuss the heating of a ship's hull as one method for eliminating and preventing icing. They present a calculative technique, the heat transfer coefficients, and specific energy consumption required for efficient utilization of heating. They also compare their calculations with the results of a full-scale experiment. Figures 4; references 5.

UDC 629.12.066

POWER INDICATORS OF MODERNIZED, THREE-SPEED, INDUCTION MOTORS IN THE ELECTRIC DRIVE OF MARINE CARGO-HOISTING MACHINERY

[Abstract of article by Babayev, A.M., Baranov, L.N., and Brovkin, A.S.]

[Text] The authors discuss the possibility of using the working characteristics of three-speed, induction motors with modernized rotors to calculate static and dynamic losses and determine the values of the temperature excesses of stator windings on the basis of data from operational tests of electric drives on the motorship "Komsomolets Uzbekistana." Figures 9; references 3.

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UDC 629.125.001.5

VIBROACOUSTIC CHARACTERISTICS OF THE MAIN DIESEL GENERATORS OF THE 'VITYAZ''
FLOATING CRANE, WITH 6ChN30/38 DIESEL ENGINES

[Abstract of article by Loshakov, V.I., and Yel'nik, A.G.]

[Text] The authors discuss questions concerning the vibration and noise of main diesel generators of the 24DG type, with 6ChN30/38 diesel engines, that have been installed on the "Vityaz'" floating crane. Figures 4.

UDC 621.125.001.5

ANALYTICAL INVESTIGATION OF THE NATURE OF THE CHANGE IN STEAM PARAMETERS IN THE
VOLUME IN FRONT OF THE TURBINE IN TRANSITIONAL MODES

[Abstract of article by Basalygin, G.M.]

[Text] The author formulates a system, based on the First Law of Thermodynamics, that makes it possible to investigate the actual nature of the change in steam parameters, with due consideration for the variable value of the polytropic exponent, in the steam chamber between the regulating valve and the turbine's nozzles. Figures 3; references 3.

UDC 629.12.06:628

A CHEMICOMECHANICAL METHOD OF UTILIZING PETROLEUM RESIDUES IN TANKERS

[Abstract of article by Bol'shakov, V.F., and Reshetnikov, I.P.]

[Text] The authors discuss the physicochemical characteristics of the petroleum residues that form in tankers. They then present a technique for preparing washed-out crude oil for use in bunkers. Figure 1.

UDC 629.12.06:628

ON THE DEVELOPMENT OF NOZZLE-TYPE HOMOGENIZING DEVICES FOR THE UTILIZATION OF
PETROLEUM RESIDUES THAT FORM ON SHIPS

[Abstract of article by Reshetnikov, I.P.]

[Text] The author presents the operating parameters of nozzle-type homogenizing devices that are designed with the help of cavitation theory and methods from the dimensional analysis of similarity and modeling.

UDC 621.125

SPECIAL FEATURES OF THE DETERMINATION OF THE TRANSIENT TEMPERATURE OF THE HEATED
SURFACE OF A MARINE STEAM TURBINE'S HOUSING

[Abstract of article by Volosov, M.I.]

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[Text] The author examines the effect of the opening in which the thermocouple is installed on the error in determining the transient temperature of a heated surface. He points out the possibility of a theoretical evaluation of this distortion by the solution of a unidimensional transient thermal conductivity problem. Figures 3; references 6.

UDC 629.12-52

MATHEMATICAL MODELS FOR AN AUTOMATED SYSTEM FOR CONTROLLING THE HEATING OF VISCOUS CARGOES IN SEAGOING TANKERS

[Abstract of article by Moshnyanskiy, A.F., and Mul'ko, V.I.]

[Text] The authors present a mathematical description of the processes involved in the heating of viscous cargoes in seagoing tankers. Figures 4; references 10.

UDC 629.12-52.001.5

CALCULATION OF THE PROCESSES INSURING THE OPERATIONAL RELIABILITY OF FUEL BUNKERAGE

[Abstract of article by Mosnyanskiy, A.F., and Mul'ko, V.I.]

[Text] The authors present a technique for the mathematical modeling, using electric network models, of the processes in a coil preheating system that support the operation of fuel bunkerage. Figures 4; references 6.

UDC 621.125.52

CAVITATION AS A MEANS OF INCREASING THE EFFICIENCY OF COMBUSTION OF HEAVY FUELS IN DIESEL ENGINES

[Abstract of article by Seliverstov, M.V.]

[Text] The author discusses the process of the appearance of cavitation and the basic factors affecting its intensity during the movement of fuel through the nozzle apparatus of diesel engine injectors. He substantiates the possibility of creating nozzle units capable of providing highly efficient fuel atomization through the organization and control of cavitation processes in the fuel jet. Figure 1; references 3.

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CSO: 1861/46

ABSTRACTS OF ARTICLES IN COLLECTION 'STRENGTH AND SEAWORTHINESS OF
SEAGOING SHIPS'

Leningrad TRUDY TSENTRAL'NOGO NAUCHNO-ISSLEDOVATEL'SKOGO INSTITUTA MORSKOGO FLOTA:
PROCHNOST' I MOREKHODNYYE KACHESTVA MORSKIKH SUDOV in Russian No 258, 1980 pp 91-92

UDC 629.12:539.4

REGULAR CHANGES IN THE BENDING MOMENT IN CALM WATER AND ITS EFFECT ON OVERALL
STRENGTH

[Abstract of article by Maksimadzhi, A.I.]

[Text] The authors discusses the shortening of the fatigue life of structures be-
cause of a regular change in the average load level in combination with the simulta-
neous effect of a random amplitudinal component. He suggests a technique for allow-
ing for this type of loading when setting strength norms. Figures 2, references 3.

UDC 629.12.002.3

INVESTIGATION OF THE CHARACTERISTICS OF 09G2 STEEL FOR THE PURPOSE OF SETTING
STRENGTH NORMS WITH AN ALLOWANCE FOR FATIGUE

[Abstract of article by Maksimadzhi, A.I., and Kuteminskiy, V.P.]

[Text] The authors analyze the results of fatigue tests of samples of 09G2 steel
under complex loading. They present data on fatigue crack growth rates as a func-
tion of the average stresses, as well as for regular changes in the latter. Figures
8; references 9.

UDC 629.12.004.5

PREDICTING THE TECHNICAL STATE OF THE HULLS OF OPERATING SHIPS

[Abstract of article by Markozov, G.V.]

[Text] The author presents a method of predicting the technical state of ship hulls
on the basis of a statistical analysis of materials from the prerepair survey of de-
fects in ship hulls. Figures 11; references 2.

UDC 629.123:56.004.4

STRUCTURAL PROVISIONS FOR THE SAFETY OF TANKERS WITH SEALED BALLAST TANKS

[Abstract of article by Mel'nikov, A.M.]

[Text] The author analyzes the possible consequences of disrupting the hermetic state of the cargo holds in tankers having sealed ballast tanks. He also formulates the requirements for the performance of hull-welding operations during the assembly of the hull structures of such ships. References 3.

UDC 629.12.011

GENERAL RELATIONSHIPS OF MAGNETIC, MECHANICAL AND THERMAL PROPERTIES AND STATES OF SHIP STRUCTURES

[Abstract of article by Guzeyev, V.T.]

[Text] The author discusses the general relationships among the magnetic, mechanical and thermal properties and states of steel ship structures on the basis of the theory of hysteresis processes. Figure 1; references 4.

UDC 629.12.004.6(083)

SPECIAL ALLOWABLE WEAR NORMS

[Abstract of article by Maksimadzhi, A.I., and Briker, A.S.]

[Text] The authors present the basic methodological propositions that must be used during the development of special wear norms for a given series of ships. They substantiate the advantages of the individual approach and point out the sources that make it possible to reduce the volume of repair work when these norms are used. Figures 6; references 6.

UDC 629.12:624.04

DETERMINING THE KINEMATIC AND POWER PARAMETERS OF RESTRICTED TORSION IN CONNECTION WITH A 'DOUBLE-PEAKED' DISTRIBUTION OF THE TORSIONAL MOMENT ALONG THE LENGTH OF A SHIP

[Abstract of article by Ul'yanova, L.I.]

[Text] The author presents a solution of the differential equation for restricted torsion when there is "double-peaked" distribution of the external torsional moments. She also discusses the question of the effect of a ship's dimensions on its stressed state under torsion. Figures 2; references 2.

UDC 629.125.8:039.073.243.4:532.59

MAIN PART OF THE DISTURBING FORCES OF A SKEG SVP DURING ROLLING IN RESPONSE TO LATERAL WAVE ACTION

[Abstract of article by Bogdanov, A.I.]

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[Text] The author explains a method for determining the righting hydrostatic and main part of disturbing hydrodynamic forces and their moments during rolling of a skeg hovercraft lying broadside to regular, progressive wave action. He also presents calculating formulas derived with due consideration for nonlinearity with respect to the righting moment. Figures 4; references 4.

UDC 656.61.052.484

WEATHER CRITERION FOR SEAGOING SHIPS WITH DYNAMIC MAINTENANCE PRINCIPLES

[Abstract of article by Bogdanov, A.I., and Strelyayev, L.N.]

[Text] The authors explain a method for determining the weather criterion for ships with dynamic maintenanc principles that are sailing in ballast. They also present an example of the calculations for a hovercraft of the skeg type. Figures 2; references 2.

UDC 629.12.073.243.4:532.59

DETERMINING FRICTIONAL DRAG DURING ROLLING OF A SHIP

[Abstract of article by Kamenskaya, Ye.N.]

[Text] The author discusses the oscillations of an elliptical body of revolution with a constant frequency around its longitudinal axis of symmetry in a uniform incident flow. In connection with this, she also obtains approximate solutions for the problem of the oscillations of a circular cylinder. Figures 2; references 7.

UDC 629.12:532.321

STABILITY OF A SHIP WITH A SHIFTING CARGO UNDER STORM CONDITIONS

[Abstract of article by Kondrikov, D.V.]

[Text] The author proposes to account for cargo movability for a ship encountering irregular wave action. He finds a zone of safe ship stability that has "upper" and "lower" boundaries. Figures 2; references 2.

UDC 629.123.561.07

AN ALGORITHM AND PROGRAM FOR DETERMINING THE BASIC CHARACTERISTICS OF GAS CARRIERS

[Abstract of article by Artsykova, A.A.]

[Text] The author presents an algorithm for calculating the basic technical characteristics and economic indicators of gas-carrying ships of different architectural-structural types. She discusses the special features of the program drawn up on the basis of the proposed algorithm, which program is written in the FORTRAN-IV algorithmic language for use with a YeS1020 computer. Figures 3.

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CSO: 1861/47

ABSTRACTS FROM COLLECTION 'WORKS OF THE CENTRAL SCIENTIFIC RESEARCH INSTITUTE OF THE NAVY: AUTOMATION OF OCEAN-GOING SHIPS'

Leningrad TRUDY TSENTRAL'NOGO NAUCHNO-ISSLEDOVATEL'SKOGO INSTITUTA MORSKOGO FLOTA: AVTOMATIZATSIYA MORSKIKH SUDOV in Russian No 259, 1980 (signed to press 24 Oct 80) pp 108-111

[Abstracts from collection "Works of the Central Scientific Research Institute of the Navy: Automation of Ocean-Going Ships", edited by Yu. I. Panin, Leningradskoye otdeleniye izdatel'stva "Transport", 1410 copies, 111 pages]

UDC 629.12-8-52

CALCULATING OPERATING FACTORS WHEN EVALUATING THE EFFICIENCY OF AUTOMATION EQUIPMENT FOR POWER INSTALLATIONS

[Abstract of article by Savin, B. V.]

[Text] A methodology is examined for calculating the operating and engineering factors in problems associated with evaluation of the efficiency of automation equipment for power installations, taking into consideration peculiarities in forming economic savings for automation equipment and establishing connections between the technical and operating characteristics of the means of production and the economic indicators and operating evaluation of the ship's work. Mathematical expressions are given for determining components of economic savings. Peculiarities in making statistical estimates of technical effectiveness indicators of automated subjects and of the economic activity of a snip are analyzed. Figure 1, table 1, references 3.

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UDC 629.12.073.286:532.5

AUTOMATING CONTROL OF SEA-GOING PROPERTIES OF SHIPS UNDER STORM CONDITIONS

[Abstract of article by Kondrikov, D. V.]

[Text] Possible schemes are proposed for control of ship safety with regard to slamming, swampability and loss of stability. Safety criteria are calculated as a function of statistical motion parameters which are determinable either by sensors or by calculation. Figures 2, references 3.

UDC 656.61.052:65.011.56

EXPERIMENTAL RESEARCH IN COMPUTER-CONTROLLED SHIP COURSE

[Abstract of article by Antonenko, V. A.]

[Text] The formulation and results of an experiment studying control of the course of a ship by a digital computer which is a part of an automated navigation complex are examined. Recommendations are given for selection of coefficients for strengthening the principle of control of a ship. Figures 2.

UDC 629.12.053

PROSPECTS FOR USING LASER TECHNOLOGY FOR AUTOMATIC CONTROL OF THE MOVEMENT OF LARGE-CAPACITY SHIPS DURING MOORING

[Abstract of article by Ignatovich, E. I. and Rakitin, V. D.]

[Text] A brief substantiation of the necessity of using systems for automatic control of the movement of large-capacity ships during mooring. Comparative characteristics for all available systems are presented, and their principal shortcomings are pointed out. Laser systems are singled out in particular as the most promising, as systems which will provide the navigator with all necessary information about ship movement and position relative to the wharf. Figures 2, table 1, references 10.

UDC 629.12:532.321

TESTING THE STABILITY OF A ROCKER USING ANGULAR RAMP

[Abstract of article by Belozerov, G. I.]

[Text] The urgency of controlling ship stability with the aim of insuring its operating safety is shown. A method is proposed for determining the metacentric height by using a lowered angular ramp, using ship heeling as a test. Simple calculations based on heel angle measurements make it possible to test the initial stability of the ship rapidly, almost without ceasing loading operations.

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UDC 656.61.052.14:527.62

EVALUATING ACCURACY IN DETERMINING SHIP POSITION COORDINATES BASED ON DATA
FROM AUTOMATED DORAN TRANSPONDERS

[Abstract of article by Komarov, S. R.]

[Text] The possibility of improving the accuracy of determination of ship
position using automated single-channel doran transponders by calculating the
effect of tropospheric and ionospheric refraction is examined. Figure 1,
references 2.

UDC 656.61.052:65.011.56

AUTOMATED NAVIGATIONAL INFORMATION RECORDING SYSTEMS

[Abstract of article by Kokolov, N. P.]

[Text] Topics in the study of the characteristics of input streams of naviga-
tional information for recording and documentation are examined. A description
of the operating process for an automated navigational information recording
and documentation system is given, on the basis of which functional dependences
of the magnitudes characterizing the influence of input stream parameters,
servicing and methods of system organization on its work quality are determined.
Figures 3, table 1, references 6.

UDC 629.12.011.1

AUTOMATED DESIGN OF EXTERNAL HULL SHAPE

[Abstract of article by Kovalev, V. A. and Myachin, V. F.]

[Text] Two-parameter curves are presented which permit two-dimensional sections
of complex surfaces, e.g. the hull of a ship, to be described mathematically.
Methods for controlling the shape of the curves by changing their parameters
are demonstrated. Figures 6, references 4.

UDC 656.61.052:65.011.56+[621.431.74:621.436-52]:53.08

USING L_k-TRANSFORMS IN SHIP AUTOMATION PROBLEMS

[Abstract of article by Sobolev, L. G.]

[Text] The concepts of the L-derivative and the L-integral are introduced
and their geometric interpretation is given. Using them, practical problems
are solved in the processing of experimental data for automation systems for
shipbuilding processes and technical diagnostics for marine diesel engines.
Examples of the practical use of an L-transform to solve a series of problems
in the theory control automation are presented. Figures 9, tables 3,
references 5.

UDC 629.12-52

EXPERIMENTAL INVESTIGATION OF L-APERIODIC LINK

[Abstract of article by Kiselev, A. M. and Burdanov, V. I.]

[Text] The results of an experimental investigation of a new class of automatic control systems with variable coefficients are examined. The transient characteristics of the L-aperiodic link are presented, demonstrating a number of advantages as compared with ordinary aperiodic links. Figures 4, references 2.

UDC 629.12-52-192

METHOD OF EVALUATING RELIABILITY INDICATORS OF SHIP AUTOMATION DEVICES

[Abstract of article by Sobolev, L. G. and Smirnov, V. S.]

[Text] A methodology is proposed for developing factual data on the reliability of ship automation devices, with the aim of determining indicators of a stable value for device failure rate and their break-in period.

The example is given of the practical use of the proposed methodology for evaluating these values based on data on the reliability of non-Soviet centralized automated control systems which are in use on a group of sea-going ships. Figures 2, references 5.

UDC 629.12.037.16

INVESTIGATING STRESS REGULATION PROCESSES IN THE DIESEL VARIABLE-PITCH SCREW PROPULSION UNIT UNDER SWELL CONDITIONS

[Abstract of article by Zalitis, V. A.]

[Text] The dynamics of a double loop system of stress regulation in a diesel variable-pitch screw propulsion unit under swell conditions is studied. A mathematical model of the system is presented which realizes nonlinear control algorithms and a nonlinear function of the change in hydrodynamic stress on the screw when the ship rolls. A computation methodology is also set out. Figures 3, tables 2, references 2.

UDC 621.181:629.12

DYNAMICS OF AUXILLARY SHIP BOILER

[Abstract of article by Galanin, A. A.]

[Text] Indicators characterizing the operation of an auxillary ship boiler in stationary mode with two-position regulation of steam pressure. Figures 3, references 2.

UDC 621.313.333:629.12.001.5+629.12.066

SIMULATION MODELING OF INDUCTION MOTOR

[Abstract of article by Tsvetkov, V. V.]

[Text] A method is presented for constructing a mathematical model of an induction motor, a model which has been improved to the point of implementation in a program which simulates the fundamental processes in the motor. Data from catalogues are the initial data for the model. Application of the model simplifies significantly calculations associated with appearance of rotor current displacement and permits the necessary set of characteristics of basic types of squirrel cage induction motors to be obtained in the shortest time. Figures 5, references 6.

UDC 629.12.066:621.311.2-192

EVALUATING MAINTAINABILITY INDICATORS FOR AUTOMATED ELECTRIC POWER PLANTS

[Abstract of article by Bykov, E. B., Myachin, V. F., Poznik, V. G.]

[Text] The task of insuring a prescribed probability that a ship's automated electric power plant will be in working condition is examined on the basis of an analysis of a Markov model of conditions. An approximate solution linking the average time for restoring the power plant to functions of the model's other parameters is given on the basis of a graphic-operational method. A numerical example is given. Figures 2.

UDC 656.61.052.7-52

AUTOMATION AND MECHANIZATION OF MOORING OPERATIONS WHEN USING SYNTHETIC HAWSERS

[Abstract of article by Bocharov, V. V. and Ivanov, L. P.]

[Text] Questions in determining the necessary minimum number of turns of hawsers made from synthetic materials when the hawsers are put onto the drum (warping drum) of hawser windlasses.

The experimental data which were obtained from testing 4 hawsers made from diverse materials displayed a good convergence with calculations and are used in the creation of automated hawser mechanisms. Figures 4, table 1.

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UDC 629.12-52.004

SELECTING PLAN FOR MAINTENANCE WORK AND REPAIR OF SHIP AUTOMATION DEVICES

[Abstract of article by Kononenko, V. I. and Petrov, V. P.]

[Text] Typical work components for maintenance work and repair of ship automation devices are presented. Plans for maintenance and repair are examined as a function of the complexity of the automation devices. Recommendations are made on the advisability of their repair or replacement. Figures 3, tables 2.

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CSO: 1861/45

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NUCLEAR ENERGY

UDC 621.039.548

NUCLEAR REACTOR FUEL CHANNELS AND FUEL ELEMENTS

Moscow TEKHNOLOGICHESKIYE KANALY I TEPLOVYDELYAYUSHCHIYE ELEMENTY YADERNYKH REAKTOROV in Russian 1981 (signed to press 9 Mar 81) pp 2, 113

[Annotation and table of contents from book "Nuclear Reactor Fuel Channels and Fuel Elements", by Georgiy Nikolayevich Ushakov, Energoizdat, 1,630 copies, 113 pages]

[Text] ANNOTATION

The author explains features of the functioning of nuclear reactor fuel elements (TVEL) along with the technical requirements for them and the basic directions for their further improvement. He discusses questions related to the purpose and layout of fuel assemblies, elements and fuel channels in nuclear reactors and describes their basic characteristics. He also discusses the designs of the TVEL's used in existing reactors and those being developed for prospective projects.

This book is intended for engineering and technical workers engaged in the development and operation of nuclear reactors in AES's.

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UDC 621.311.25:621.039.5

EQUIPMENT AND TOOLING FOR REPAIR OF CHANNEL TYPE ATOMIC REACTORS

Moscow ATOMNYYE ELEKTRICHESKIYE STANTSII in Russian No 2, 1979 pp 136-138

[Article by A. Ya. Shvets and A. G. Kuznetsov]

[Text] Operating experience with channel reactors has shown that working relia-
bility depends in great measure on the availability of a well conceived and developed
repair technique and reliably operating repair equipment and facilities.

The repair facilities for channel reactors differ from those for vessel reactors
in lower mass, but are much more complicated in their kinematic chains. Fittings
and attachments are worked out for a specific technological process. Some standar-
dization in equipment is achieved by using identical drives, grapplers and configu-
rations. Reactors at the Beloyarsk and Bilibino nuclear electric plants are struc-
turally quite different, and each plant has its own technological processes and
repair facilities. The Energiya Scientific Production Association in cooperation
with the Beloyarsk and Kursk nuclear power plants is doing research on developing
new technology for repairing reactors and individual components. In conformity
with the new technology, a great number of repair facilities and devices are now
being developed and made.

In extraction of the process channels at the BAES [expansion not given] nuclear
electric plant, there was a possibility of wedging. A device was made for cutting
off a partly extracted and wedged channel. Before the channel is extracted, the
device is installed on its head and connected to a remote control system. As the
channel is being extracted, the device is raised to a certain height and follows
along with the channel as it moves. In case of necessity, the operator can use
remotely controlled clamps to fasten the attachment to the channel and sever it
with a cutting tool. In case the cutting tool breaks, a spare cutting head is
provided on the attachment.

When extracting process channels that are situated alongside the channels of the
reactor control system, the available cutting tools cannot be used to cut off the
head because the clearances are very small. To do this operation, devices have
been made for cutting off the head right down to where the steam chamber is opened.
The cutting is done by a core drill with automatic feed. Working time of the at-
tachment is 30 minutes.

Extraction of shut-down channels required containers for transportation. These
containers are made with double walls between which iron shot is poured.

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Since extraction of emergency fuel elements involves crumbling of the fuel, devices have been developed for cleaning the cells with the use of both mechanical devices and hydraulic heads. In mechanical cleaning of the cell the devices had reliable packing preventing emission of contaminated particles into the central building. Brushes were moved by a machine tool.

To free the tubes of the fuel elements from the steam chamber of the process channel heads, a drilling head was developed enabling simultaneously drilling out three tubes. A distinguishing feature of this head is the close spacing of holes. The drill is rotated by a central distribution gear. The gear is driven by a series-produced pneumatic machine.

The considerable experience accumulated by Leningrad Nuclear Electric Plant in repairs of RBMK-2 reactors enables determination of the most feasible solutions in designing repair equipment and facilities.

At Energiya Scientific Production Association, research has been done on developing a set of attachemnts for repair of process channels. The following devices have been developed: for cutting off a whisker joint, for replacing an extracted part of a valve, for extracting a process channel, and for cutting off the head of the reactor control system.

In the process of reactor operation, it has been found that the installed weld of the stack may be broken. For this case, technology has been developed for blocking the process channel and replacing the stack. To perform these operations, the following devices have been developed:

1) for electric-contact cutting of the steam-water lines;

2) for cutting the stack;

3) for dressing the seam of the stack;

4) for turning down $\emptyset$ 121;

5) grabs for transporting the stack;

6) separate centering devices and gages.

For welding in the new stack, a specialized organization has developed a welding device in cooperation with the Energiya Scientific Production Association that welds in the new stack and provides the necessary reinforcement.

Nuclear power plants should give serious consideration to preparation of attachments and devices for performing operations. To solve these problems at the Kursk Nuclear Electric Plant, two stands have been developed: a stand that simulates the stack zone, and a full-scale trainer stand for adjustments of all kinds of tools and instruments. Considerable headroom is needed for the latter stand.

This stand is accommodated in the central building. The stand has four channels, which brings the facility very close to reality. Since the stand is quite high (more than 16 m), the metal structural components are made in sections. Erection

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of the structural components is started on the floor level of the central building, and the metal structure is lowered as production proceeds. The channel simulators are installed last. These are of tubular design with interchangeable elements. Replacement of elements is simple, and as a rule is done without disassembling the channels. This solution is due to the fact that mechanical treatment of the elements is done when adjusting tools. Some zones of the channel are cut out so that the operation of the cutting heads can be observed. Graphite brickwork is simulated in the stand. Special mechanisms are provided to create the effects of destruction of the brickwork. These mechanisms can create effects of breaking the rods of the brickwork, canting of individual elements and so on. The stand is equipped with a large number of observation areas. Vertical ladders are provided for access to these areas. All these areas have local lighting, compressed air tubes and intake ventilation to provide the necessary exchange of air. On the lower area of the stand is a rolling platform with a lifting table used to raise tools for doing operations on the lower level of the reactor. Along the stand is a shaft through which attachments are passed. The crane of the central building is used to raise and lower tools and attachments.

The following technological processes can be done on the trainer stand: replacement of a process channel, replacement of a casing, straightening graphite brickwork, cleaning brickwork. The following devices are aligned on the stand: for measuring the end displacement of a whisker weld, for cutting off the tubes of the steam-water line, for extracting a process channel, for extracting reactor control rods when the cable breaks, for extracting a thermocouple, for cutting off the upper casing, for cutting off a whisker weld, automatic whisker welder, for cutting off calatches, for cutting down a whisker weld, breaking and extracting a channel of the reactor control system, for cutting bellows and so on.

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REPAIR EQUIPMENT AND TOOLING FOR VESSEL TYPE ATOMIC REACTORS

Moscow ATOMNYYE ELEKTRICHESKIYE STANTSII in Russian No 2, 1979 pp 132-136

[Article by A. Ya. Shvets and A. G. Kuznetsov]

[Text] Years of operating experience with vessel type nuclear reactors have shown that successful use necessitates development of a complex of devices enabling inspection and repair of the reactor vessels and equipment inside the vessel. The All-Union Heat Engineering Institute imeni F. E. Dzerzhinskiy has developed a thick-walled container for vessel inspection. An operator inside the container inspects the inner walls of the vessel through inspection ports along a helical line around the walls of the container. But experience has shown that it is difficult to make repairs on vessels as the container has no vertical drive. Lack of a drive makes it necessary to move tools and attachments through passageways located at different heights, which is difficult to do in a restricted space. For the Kola Nuclear Electric Plant, engineering plans were developed for an autonomous container, and from these plans the Energiya Scientific Production Association made two versions of devices for inspection and repair of reactor vessels--the URK-1 and URK-2. The first one is now in use at the Kola Nuclear Electric Plant. The URK-1 facility for inspection and repair of a reactor vessel is a cab that carries two operators, who are protected from radiation exposure by double steel walls between which lead shot is poured. Shielded inspection ports made of special glass are provided in the walls and floor of the cab. The cab is equipped with the Krug-2 device that enables mechanical treatment of the inside walls of the reactor. In addition, there are passageways in the walls of the cab through which hose manipulators can be operated when necessary. In the bottom of the cab is a hatch that can be opened for access to the reactor floor. There is a block and tackle with lifting capacity of 0.5 metric ton for raising the hatch and for lowering heavy items from the container to the floor.

Inspection and repair in the vicinity of the upper branch pipes are done through an extension tube with sliding door. There is an inspection port in the door. The cab is equipped with intake ventilation for adequate air exchange and slight pressurization. Since the operators in the cab must work in pressuirzed suits, the cab has an air supply for breathing. The zone of inspection is illuminated by spotlights controlled from inside the cab. The cab contains a local control panel and telephone equipment, and there is a recess for installing nondestructive inspection devices. The radiation environment is monitored inside the cab and on its outside walls by dosimeters that send readings to a central control panel.

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The operators enter the cab through a vertical hatch, descending by a ladder. The hatch is composite, made up of two sections; conduits and ducts pass inside the hatch (airways, electrical, monitoring and measurement instrumentation conduits). Commutation of electrical equipment is done by plugs. The hatch is square in shape and has double walls. Lead sheets are packed between the walls. The hatch is attached to the cab by pins, and the whole unit can be located in the vertical plane in any of eight positions 1200 mm apart. The outer walls of the hatch are provided with lugs for fixing in these positions. Falling into these lugs are longitudinal shafts mounted in levers that pivot on pins set in two rockers. Suspended from these same rockers are four pneumatic cylinders with rods secured to stationary brackets. When compressed air is fed to the cylinders, the rods move out and rotate the levers, freeing the lugs of the hatch, but this can occur only if the lugs are somewhat elevated above the axles of the rocker arms. Disengagement is impossible unless this elevation has taken place. This prevents accidental freeing of the hatch and cab from the restraining device.

In case of necessity, the cab can be raised to the extreme upper position and fixed there even in the absence of compressed air. For this purpose, beneath the lugs on the walls are bevels over which the shafts will be brought out of engagement as the cab and hatch are raised. The cab restraint system is installed on a rotating frame that bears on a base through a support bearing. The frame is rotated by a gear train driven by an electric motor. The rotating frame and base have radiation shielding. For installation of the facility, ears are provided in the upper section of the hatch into which pins fit that engage with a crossbeam carried by a hook on the crane of the central reactor building.

For doing inspections and repairs on the vessel, the URK-1 is first assembled with the hatch and rotating platform on a special stand; by means of the crossbeam, the assembled container is grasped by the crane of the central building, and placed in the reactor. In doing this, the cab may be placed in any of the eight positions. The positions are selected so that neighboring inspection zones overlap. During inspection and repair in a single position, the hook of the crane is disengaged from the crossbeam. In case of necessity, an operator can rotate the cab through 360°, and stop it at the point required for inspection and repair.

Changing from one position to another is handled by the crane of the central building. The operators working in the cab must leave it during this change. The walls and floor of the cab and hatch have a covering that can be decontaminated. The total mass of the facility is 137 metric tons. The overall dimensions of the cab, hatch and platform permit railroad transportation. The lead shot is removed during transportation. The mass of the heaviest component in this case is 15 metric tons.

Utilization of the URK-1 has enabled precise determination of the radiation environment inside the cab, as well as evaluation of convenience of servicing and technical capabilities. These results have been the basis for a second model of the container --the URK-2--with design and development incorporating the following changes: the cab is raised and lowered by an autonomous hoisting mechanism with all its actuating elements in the "clean" zone so that they can be serviced by repair personnel when the container has been lowered into the reactor; mounted in the cab is the Krug-1 device that enables mechanical treatment of the walls and floor of the reactor with control from the cab; shielding thickness has been increased; provisions have been made for doing inspection operations on the vessel with nondestructive monitoring equipment.

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Passageways for installation of additional repair attachments are provided in the walls of the cab. Construction of the URK-2 is comparatively simple, and it is designed for repair under nuclear electric plant conditions.

For doing jobs on inspection and repair of reactor vessels, the URK-2 is assembled on a scaffolding. The hook of the crane of the central building that is used to lift the crossbeam has a hoisting capacity of 250 metric tons. The hook raises the facility above the scaffold and transports it to the reactor. After the facility has been lined up over the reactor, it is lowered until it is stopped by the joining with the reactor. After the URK-2 container has been installed on the main joining, the crossbeam is disengaged from the hatch, and set aside in the central building. The container is connected to the life support systems, power supply, compressed air, to the central control panel and systems for communication, television, monitoring and measurement instrumentation and radiation monitoring systems.

From this instant the facility is considered ready for operation. Elevation and rotation of the cab can be controlled from the central or local panel. Since the hoisting mechanism is a step-by-step type, raising and lowering are done in stages, all operations of staged raising and lowering being done automatically. In case of necessity, the cab can be raised by the crane of the central building. The hoisting mechanism is backed up by a second interlocking system that enables smmoth descent of the cab to a lower position. The operator controls the mechanisms from the local control panel, and can set the cab in any place to be inspected and repaired.

To inspect and repair the bottom of the shaft, a container has been developed that is a square chamber with rollers installed on the bottom. A vertical tilter is placed on the rollers that is rotated from two chains wound on a drum that is turned by a worm drive. The worm is turned manually. Welded inside the tilter are two horizontal strips: one for installing bottom plates of the V-210 reactor, and the other for VVER-440 reactors. For shielding servicing personnel, the chamber is filled with water, and the top of the reactor is covered with additional shielding plates. Inspection and repair of bottom plates is done from above. In doing this, one plate is removed that is situated opposite the row of shielding tubes to be repaired. In case of necessity, the tilter is turned through the required angle (up to 180°), enabling inspection and repair of the top and bottom of the cover.

To replace shielding tubes in the V-210 reactor, a device has been developed for cutting the weld of the shielding tube and breaking it. The weld is cut by cutters installed in a cutting head. The cutting head is turned by a pneumatic motor through a gear train.

For extracting the reactor shaft, a special device has been developed that is a platform with vertical walls. The bottom and walls of the platform are thickened to reduce the radiation background. The platform carries four brackets in which there are two extensible shafts apiece. The brackets can change position within a range of 2-3°. Gates are made in the walls, through which the straps that hold the shaft against the vessel can be clamped and released. The platform is suspended on four bars fastened to a cruciform crossbeam. Tne ends of the crossbeam terminate in hydraulic jacks. On the crossbeam is an eyebolt to engage the hook of the crane

of the central building. Between the crossbeam and platform is a ladder by which servicing personnel can descend to the platform.

To remove the shaft, the device is lowered by the crane of the central building into the reactor until it is stopped by contact of the hydraulic jacks with the main joining. Then the shafts are extended. In case they do not line up with the holes in the shaft, screw jacks are used to shift the brackets until the shafts line up with the holes. After all shafts have been fixed in position, the gates are opened and the straps are unfastened. The straps are stacked on the platform, and the repair personnel leave. The hydraulic jacks are then used to break the shaft loose, which may require a force of up to 50 metric tons. The crane of the central building is used to hoist and remove the shaft.

At nuclear electric plants it is important to reduce the volume of soft radioactive waste that must be disposed of by burial. It is difficult to use existing presses for this purpose as they are cumbsersome and are not adaptible to decontamination. Because of this, the "Briket-1" press has been developed for compacting radioactive waste. This press reduces the volume of soft wastes by eightfold. The ram develops a force of 32 metric tons. All components of the press that come into contact with radioactive waste are made of stainless steel. The press is remotely controlled. The compacted waste is manually banded, and ejected by a horizontal hydraulic cylinder. The press masses three metric tons and takes up 12 sq. m of space.

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INDUSTRIAL TECHNOLOGY

UDC 621.039:519.1.001.2

SYSTEMS-MORPHOLOGICAL APPROACH IN DESIGNING ATOMIC EQUIPMENT

Moscow KONSTRUKTORU O KONSTRUIROVANII ATOMNOY TEKHNIKI: SYSTEMNO-MORFOLOGICHESKIY
PODKHOD V KONSTRUIROVANII in Russian 1981 (signed to press 27 Nov 80) pp 2, 189-190

[Annotation and table of contents from book "To the Designer, on the Designing of
Atomic Equipment: The Systems-Morphological Approach in Designing", by Viktor
Mikhaylovich Kapustyan and Yuriy Aleksandrovich Makhotenko, Atomizdat,
5,000 copies, 191 pages]

[Text] ANNOTATION

The authors suggest a combinatory concept of working with alternatives that differs
from the well-known concepts in that great compression of factual and graphic data
is achieved in it. They develop fundamentally new systems-morphological optimiza-
tion methods and a general logic method for making decisions during the design pro-
cess. On the whole, combinatory methods for making decisions are an independent
trend in the theory and practice of control and design that is called the systems-
morphological approach in this book. In particular, the authors explain the princi-
ples of the mathematical apparatus for the echelon-by-echelon calculations used to
solve optimization problems in designing.

This book is intended for designers of new equipment and is indispensable for spe-
cialists in various branches of machine and tool building, scientific workers spe-
cializing in the field of decision-making theory in designing, and graduate students
and students in high-level courses in VUZ's. It can also be used as a teaching aid
when upgrading the qualifications of engineering and technical personnel. Figures
53; references 90.

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UDC 621.14

SELECTED ABSTRACTS FROM COLLECTION 'EXPERIMENTAL STUDY AND DIAGNOSIS OF ROBOTS'

Moscow EKSPERIMENTAL'NOYE ISSLEDOVANIYE I DIAGNOSTIROVANIYE ROBOTOV in Russian 1981 (signed to press 5 May 81) pp 181-184

[Abstracts from collection 'Experimental Study and Diagnosis of Robots,' edited by Ye. G. Nakhapetyan, USSR Academy of Sciences, Division of Mechanics and Control Processes, Institute of Mechanical Engineering imeni A. A. Blagonravov, Izdatel'stvo "Nauka", 1950 copies, 184 pages]

UDC 621.14

QUALIMETRY AND THE DIAGNOSIS OF ROBOTS

[Abstract of article by Nakhapetyan, Ye. G]

[Text] The article discusses questions involving selection of measurable and recordable parameters on the basis of conditions under which robots will be employed. It contains tables of the levels of quality analysis for robot linear and angular positioning mechanisms. The most important complex quality indicators are indicated for these mechanisms with experimental values presented for these indicators as determined with respect to a number of robots with varying types of drive. Tables - 6; bibliography - 5 titles.

UDC 620.1.08

THE PROBLEM OF SELECTING MEANS OF COLLECTING QUALIMETRIC INFORMATION IN STUDYING AUTOMATIC MACHINES AND INDUSTRIAL ROBOTS

[Abstract of article by Merzlyakov, A. A.]

[Text] This selection examines questions associated with the preparation of experimental studies of automatic production equipment and industrial robots with respect to selection of the necessary primary measuring transducers (sensors). It discusses a method of selecting sensors based upon use of the results of statistical analysis of a number of dynamic parameters of the processes under study. It sets forth an engineering approach to the selection of sensors with the required metrological and informational characteristics. Illustrations - 5; bibliography - 4 titles.

UDC 007.52.001.4

REQUIREMENTS FOR CERTIFICATION TESTS OF INDUSTRIAL ROBOTS

[Abstract of article by Kolpashnikov, S. N., Konyukhov, A. G., Korytko, I. B. and Chelpanov, I. B.]

[Text] This article establishes the need for a unified system of state certification for industrial robots. It discusses specific methods of establishing standards for basic indicators. It proposes a method of experimentally establishing accuracy indicators for positioning and orientation under both static and dynamic conditions. Illustrations - 3; bibliography - 8 titles.

UDC 62-501.72

HALF-SCALE MODELING DEVICE FOR EXPERIMENTAL STUDY OF A MANIPULATION ROBOT

[Abstract of article by Dorotov, V. V., Moiseyenkov, V. A., Rakhmanov, Ye. V. and Shvedov, V. N.]

[Text] This work deals with the application of a method of physical modeling in the process of designing manipulation systems. The use of physical models makes it possible to check not only the basic characteristics of the system under study, but to test its components and assemblies as well. As an example the work looks at variants of the principles governing construction of a modeling device to study a manipulator having flexible components. It describes the design of one version of such a device as well as some results of a study of its dynamics for purposes of comparison with the dynamics of the manipulator, results characterizing the degree of similarity of the dynamic characteristics of the two. Illustrations - 5; bibliography - 4 titles.

UDC 681.516.75

EXPERIMENTAL FACILITY FOR THE STUDY OF INTERACTIVE ROBOT-CONTROL SYSTEMS

[Abstract of article by Chernorutskiy, G. S. and Sibrin, A. P.]

[Text] This article examines aspects of the experience accumulated in constructing facilities comprising a dynamic test stand, a computer and peripheral equipment and designed for half-scale modeling of dynamic processes and of the functioning of the sensitization of robots. Illustrations - 6; bibliography - 7 titles.

UDC 621.519

M-6000-COMPUTER DEVELOPMENT OF A MOCKUP FOR STUDYING OPERATOR-MANIPULATOR SYSTEMS

[Abstract of an article by Orlova, G. N. and Tyves, L. I.]

[Text] This article describes a mockup for studying operator-manipulator systems and contains the program supporting the experiment as well as results of preliminary experiments. Illustrations - 3; bibliography - 2 titles.

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UDC 621.9.06

DYNAMIC TESTS OF A SECOND-GENERATION INDUSTRIAL ROBOT

[Abstract of an article by Anan'yeva, Ye. G., Klebanova, O. N. and Nakhapetyan]

[Text] This article deals with dynamic methods of testing the positioning mechanisms of an industrial robot. It describes a method of studying a robot and presents test results. It compares obtained robot characteristics with passport data. The work demonstrates the effect of the rigidity of the positioning mechanisms upon the precision with which is worked out the given exponential law of motion. It presents the results of a study of a robot in the "receive command," "search" and "position part" modes. Tables - 5; illustrations - 3; bibliography - 1 entry.

UDC 007.52

DIGITAL-COMPUTER MODELING AND EXPERIMENTAL STUDY OF THE DYNAMICS OF INDUSTRIAL ROBOTS WITH PNEUMATIC DRIVE

[Abstract of an article by Karklin'sh, A. K. and Raynes, Ya. K.]

[Text] The selection examines the role of computer modeling and experimental studies of the dynamics of industrial robots (IR) with pneumatic drive in the process of their design and operation. It describes the apparatus employed in experimental studies of IR. The work contains results of experimental study of a specific robot and compares them with those obtained by computer modeling. Tables - 1; illustrations - 4; bibliography - 4 titles.

UDC 007.52:62-85

SELECTING DESIGN AND PARAMETERS OF BRAKING MECHANISMS FOR THE PNEUMATIC DRIVE OF AUTOMATIC MANIPULATORS

[Abstract of an article by Kreynin, G. V. and Solntseva, K. S.]

[Text] This work examines the results of comparative analyses of different methods of braking large mobile masses. The modulus of rotation of an automatic manipulator was employed in these studies. Rotation was achieved by means of a rack-and-pinion mechanism actuated by two pneumatic cylinders. The mass of the moving parts reduced to a common rod for the two cylinders was 7000 kg. Illustrations - 2; bibliography - 2 titles.

UDC 62.-62.387

SELECTING THE PARAMETERS OF HYDRAULIC SHOCK ABSORBERS FOR THE PNEUMATIC DRIVE OF INDUSTRIAL ROBOTS

[Abstract of an article by Tsukhanov, Ye. A., Yashina, M. A. and Gets, V. B.]

[Text] This article examines a method of selecting the parameters of a hydraulic shock absorber with continuously varying aperture areas with limited pressure, acceleration or braking stroke. It presents results of tests of a model hydraulic shock absorber braking a pneumatic drive, results confirming theoretical conclusions. Illustrations - 4; tables - 1; bibliography - 2 titles.

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[UDC omitted in original]

OPTIMIZING MOVEMENTS OF INDUSTRIAL ROBOTS IN SHEET-METAL STAMPING OPERATIONS

[Abstract of an article by Semenov, Ye. I., Shchegoleva, A. P. and Suleymanov, B.]

[Text] This article presents results of experimental study of a group of mechanical parameters of the PR-10I and UM-1 industrial robots insuring optimal trajectories of the working devices with the equipment in the given sheet-metal-stamping configuration. The PR-10I is optimized by integrating movements with respect to two coordinates (rotation-extension), the UM-1 by determining trajectories with respect to time minimum as a function of arm sweep and angular rotation with equal pressure differentials in the hydraulic cylinders at the moment of braking. Illustrations - 7; bibliography - 2 titles.

UDC 621.9.06

STUDY AND QUALIMETRIC METHODS OF EVALUATING THE EFFICIENCY OF INDUSTRIAL ROBOTS WITH PNEUMETIC DRIVE

[Abstract of an article by Anan'yeva, Ye. G., Velikov, R. V., Pavlova, T. T., Rozin, B. Sh. and Shvetskov, V. N.]

[Text] This article deals with experimental study and qualimetric methods of evaluating the efficiency of industrial robots with pneumatic drive. It describes a standard experimental procedure and presents the basic results of a study of the positioning mechanisms of two industrial robots. It gives a number of qualimetric coefficients characterizing the speed of a robot, the level of the dynamic loads acting upon the positioning mechanisms and the precision with which has been worked out the given law of motion. The work compares the two robots with respect to the results of the experimental study and to qualimetric coefficients. Tables - 3; illustrations - 4; bibliography - 2 titles.

UDC 621.9.06

EXPERIMENTAL STUDY OF AN INDUSTRIAL ROBOT WITH AN ELECTROHYDRAULIC CONTROL SYSTEM

[Abstract of an article by Anan'yeva, Ye. G., Mironov, A. I., Nakhapetyan, Ye. G., Soldatskiy, Ye. P. and Chelyshev, V. A.]

[Text] This article deals with experimental studies of an industrial robot with an electrohydraulic control system. It describes a standard experimental procedure permitting determination of basic quality indicators during sequential functioning of robot mechanisms and indicates special features of the procedure associated with study of the effect of the variable gear ratio of the horizontal arm-movement mechanism. It gives results of a study of the mechanisms of the robot's vertical and horizontal arm movements and of the mechanisms of column and gripper rotation. The work compares the characteristics of the model tested with those of a robot of analogous design. Tables - 3; illustrations - 3; bibliography - 3 titles.

UDC 621.9.06

DETERMINING THE BASIC CHARACTERISTICS OF AN INDUSTRIAL GANTRY ROBOT

[Abstract of an article by Anan'yeva, Ye. G. and L'vov, D. Ye.]

[Text] This article discusses a study of an industrial gantry robot. It describes the procedure employed in testing the robot and presents the results of the test. It indicates how this procedure differs from the standard procedure, these differences stemming from the special features of this particular robot design. The work discusses the results of a study of oscillations of the traverse along both the longitudinal and transverse axes occurring during robot operation. It gives values of quality coefficients, permitting comparison of the design of the robot tested with other designs. Tables - 3; illustrations - 3; bibliography - 2 titles.

UDC 621.9.06:007.52

STUDY OF A MANIPULATOR MECHANISM WITH HIGH-SPEED FILMING

[Abstract of an article by Kravchenko, N. F.]

[Text] This work describes a procedure for testing the kinematic, dynamic and precision parameters of a manipulator mechanism by high-speed filming of its movements. It presents the results of kinematic, dynamic and precision tests of the SMT-700 manipulator. Illustrations - 3; bibliography - 4 titles.

UDC 621.9.06

STUDY OF THE EFFECT OF DYNAMIC FORCES ON ROBOT ARM MOVEMENT

[Abstract of an article by Anan'yev, A. N.]

[Text] Criteria permitting evaluation of the precision of robot arm movement are presented. It is shown that the precision with which a given arm movement trajectory is reproduced is a function of robot parameters and the distribution of motion between drives. The work demonstrates the deviation of a robot arm from a desired trajectory as a result of the effect of dynamic forces. Table - 1; illustrations - 5; bibliography - 2 titles.

UDC 681.532

STUDY OF METHODS OF ENHANCING THE PRECISION OF MANIPULATION ROBOT POSITIONING WITH THE USE OF ADDITIONAL POSITIONAL FEEDBACK TO THE COMPUTER

[Abstract of an article by Kuzetenko, A. S., Lomaka, M. V. and Fedorov, V. P.]

[Text] This article describes the use of an automated test for correcting control inputs for degree of manipulation robot (MR) mobility for the purpose of enhancing positioning precision.

The work examines two categories of MR positioning error occurring during the movement of the MR working device, errors which are difficult to anticipate and describe analytically and errors resulting from insufficiently accurate information from sensors for the processes in question. On the basis of the example of potentiometric positional sensors, the work studies the causes and nature of measuring-potentiometer error and examines a variety of ways to take them into account and to enhance the precision of

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the information received from these sensors. It proposes methods of increasing the precision of MR positioning by means of control computers in the control loop. It presents practical test results. Tables - 1; illustrations - 3; bibliography - 3 titles.

UDC 621.01

ANALYSIS OF HYDRAULIC CONTROL DEVICES OF INDUSTRIAL ROBOTS MOVING ON TWO COORDINATES

[Abstract of an article by Levitskiy, D. N.]

[Text] This work analyzes a hydraulic control device with movement in two coordinates for the purpose of insuring planned gripper braking and of enhancing positioning precision within a short time cycle. Gripper movement is determined in cylindrical coordinates. The braking device is designed as a controllable throttle having independent drive. Geometrical parameters of the braking device are calculated on the basis of conditions associated with braking with constant negative acceleration. Illustrations -
- 2; bibliography 3 titles.

UDC 007.52:681.5

ALGORITHM FOR IDENTIFYING OBJECTS ON A DISCRETE INFORMATIONAL SURFACE

[Abstract of an article by Lashko, Ye. B. and Salamandra, B. L.]

[Text] This article presents an algorithm for tracing the contour of an object lying on a discrete informational surface; it discusses evaluative characteristics of objects on the basis of which they are identified. Illustrations - 2; bibliography - 5 titles.

UDC 007.52:681.5

ONE METHOD OF TACTILE SENSITIZATION OF ROBOTS

[Abstract of an article by Yevstigneyev, V. N., Koliskor, A. Sh., Modestov, M. B. and Chudov, V. A.]

[Text] This selection examines the tactile sensitization of robots to obtain information about the form of objects with the use of autonomous sensitizers; it establishes the possibility of using several contact and noncontact sensors as robot sensitizers. It presents algorithms determining control inputs to robot component drives with the use of these sensors. Illustrations - 6; bibliography - 11 titles.

UDC 621.01:629.1.033.3

THE PROBLEM OF DYNAMICALLY STABLE, SYMMETRICAL WALKING-MACHINE GAITS

[Abstract of an article by Korenovskiy, V. V.]

[Text] This article establishes dynamically stable gaits for 4- and 6-legged walking machines on the basis of state phase stability criteria. It is demonstrated that in the case of both quadrupeds and hexapods, the greatest number of dynamically stable gaits is to be obtained from phases of the nonstable state both in the direction of movement and counter to it. To achieve substantially larger regions of stable locomotion with phases of lateral instability requires considerable rates of walking-machine movement. Illustrations - 2; bibliography - 1 title.

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UDC 621.01:629.1.033.3

MODEL OF A WALKING DEVICE

[Abstract of an article by Umnov, N. V., Pogrebnyak, A. Ya., Bal'zhanov, D. Ts., and Andrianov, N. A.]

[Text] This article describes a systematic model of a 6-legged walking device equipped with orthogonal operating mechanisms. It discusses methods by which walking systems may be turned. The work also presents the results of experimental studies. Illustrations - 4; bibliography - 8 titles.

UDC 62.506.3 + 007.52

FORMULATION OF THE LOGIC PROBLEM IN INDUSTRIAL-ROBOT DIAGNOSTICS

[Abstract of an article by Surnin, B. N. and Shushko, D. A.]

[Text] This work elaborates a number of diagnostic concepts, states the basic task involved in industrial-robot diagnostics and presents working formulas for calculating the probabilities of various industrial-robot (IR) states. It treats the special features of IR diagnostics as an informational problem and proposes working formulas constructed in both Kalbek's [transliterated] and Shannon's terms for calculating one of the basic quality characteristics of information value--the diagnostic importance of a scheme of criteria. In presents in conclusion an example of analysis of information value on the basis of results of analysis of test data. Tables - 3; bibliography - 4 titles.

8963
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HIGH-ENERGY DEVICES, OPTICS AND PHOTOGRAPHY

UDC 621.375.8

MACROSCOPIC AND MOLECULAR PROCESSES IN GAS LASERS

[Annotation and table of contents from book "Macroscopic and Molecular Processes in Gas Lasers", by Vladimir Nikolayevich Karnyushin and Rem Ivanovich Soloukhin, Atomizdat, 1700 copies, 200 pages]

[Text]   Annotation

This book explains questions of the physics and technology of flow-through gas lasers with rotational oscillatory transitions. Macroscopic and molecular processes are examined in detail in gas-discharge lasers with convective cooling of the working medium and gas dynamic lasers with near-resonant oscillatory exchange in the region of supersonic flux mixing. A considerable amount of attention is devoted to analyzing experimental findings and explaining the influence of the various factors on the power characteristics of flow-through laser systems.

The book is intended for a broad group of specialists interested in problems of developing and applying laser technology, and for teachers, graduate students and senior students in engineering and physics courses.

Two tables, 89 illustrations, 413 bibliographic references.

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UDC 537.527;533.9

ELECTRIC-ARC CONVERTERS WITH INTERELECTRODE INSERTS

Novosibirsk ELEKTRODUGOVYYE GENERATORY S MEZHELEKTRODNYMI VSTAVKAMI in Russian 1981
(signed to press 5 Jun 81) pp 2, 220-221

[Annotation and table of contents from book "Electric-Arc Converters with Interelectrode Inserts," by Mikhail Fedorovich Zhukov, Anatoliy Stepanovich An'shakov, Ivan Mikhaylovich Zasypkin, Yuriy Vasil'yevich Kurochkin, Vladimir Petrovich Lukashov and Aleksandr Vasil'yevich Pustogarov, USSR Academy of Sciences, Siberian Division, Institute of Thermal Physics, Izdatel'stvo "Nauka", Siberian Division, 1000 copies, 222 pages]

[Text] This monograph presents the results of theoretical and experimental studies of the electrophysical and thermophysical processes occurring in arcs burning in plasmotrons with MEV [interelectrode inserts]. Pulsation characteristics of a turbulent flow with an arc burning in it are measured; data are presented on the electrical field intensity of an arc in a turbulent gas flow. Set forth as well are the theoretical basis and results of experimental studies of heat exchange between the arc and the gas flow and of the use of slot injection and the injection of gas through the porous wall of the MEV to increase plasmotron thermal efficiency and output. The work discusses the effect of the application of an external magnetic field on electric arc characteristics and a number of special types of plasmotrons with MEV (plasmotrons with gas-vortex MEV, composite MEV etc.). Material presented here may provide a basis for the development of efficient high-enthalpy generators of low-temperature plasma.

The book is intended for scientists, engineers and students in institutions of higher education specializing in the field of the study and use of low-temperature plasma.

Illustrations - 141; bibliography - 180 entries.

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